IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: **Prichett** Docket: **TI-31005**

Serial No.: **09/851,191** Examiner: **S. C. Pathak**

Filed: **May 8, 2001** Art Unit: **2634**

For: **IF-TO-BASEBAND CONVERSION FOR FLEXIBILE FREQUENCY PLANNING CAPABILITY**

APPELLANTS' BRIEF

August 1, 2007

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I hereby certify that the above correspondence is being facsimile transmitted to the Patent and Trademark Office on August 1, 2007.

Robert N. Rountree

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Dear Sir:

In support of their appeal of the Final Rejection of claims in the above-referenced application, Appellants respectfully submit herein their brief. Please replace the Appeal Brief filed December 20, 2005, with this Appeal Brief.

1. REAL PARTY IN INTEREST

Texas Instruments Incorporated is the real party in interest.

2. RELATED APPEALS AND INTERFERENCES

No other related appeals or interferences are known to Appellants.

3. STATUS OF CLAIMS

Claims 1-19 are in the application. Claims 20-21 are cancelled without prejudice. Claims 1-19 are rejected under 35 U.S.C. § 103(a). Examiner in an Office Action of June 28, 2005 made final rejection of claims 1-19. Examiner reaffirmed the June 28, 2005 rejection in an Advisory Action dated September 21, 2005. Claims 1-19 are on appeal and are reproduced in the Appendix to Appellants' Brief filed herewith.

4. STATUS OF AMENDMENTS

No amendment was filed subsequent to final rejection.

5. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to an RF receiver apparatus as in Figure 3. The receiver includes mixing circuitry (33) formed on a first integrated circuit (31) for mixing an analog RF signal (RF) down to an analog IF signal (37). (page 6, lines 11-13). An analog IF-to-digital baseband converter (34) is formed on the first integrated circuit (31) and coupled to the mixer for converting the analog IF signal into a digital baseband signal. An output (38) coupled to the analog IF-to-digital baseband converter transmits the digital baseband signal. (page 6, lines 7-8).

Independent claim 9 is directed to a baseband processor apparatus as in Figure 3. The baseband processor includes an input (38) for receiving a digital baseband signal from an RF receiver apparatus (31). The RF receiver apparatus (31) includes mixing circuitry (33) formed on a first integrated circuit (31) for mixing an analog RF signal down to an analog IF signal (37) and an analog IF-to-digital baseband converter (34) formed on the first integrated circuit (31) and coupled to receive the analog IF signal. (page 6, lines 11-13). A digital communication processing portion (36) is coupled to the input for performing a digital processing operation on said digital baseband signal. (page 6, lines 8-11).

Independent claim 13 is directed to a communication receiver as in Figure 3. The receiver includes an RF receiver apparatus (31) having mixing circuitry (33) for mixing an analog RF signal down to an analog IF signal and an analog IF-to-digital baseband converter (34) coupled to said mixer for converting said analog IF signal into a digital baseband signal. (page 6, lines 11-13). An output (38) coupled to the analog IF-to-digital baseband converter outputs the digital baseband signal. The RF receiver apparatus is formed on a first integrated circuit (31). A baseband processor apparatus (36) has an input (38) coupled to the output (38) of the RF receiver apparatus (31) for receiving the digital baseband signal from said RF receiver apparatus. A digital communication processor (36) coupled to the input (38) performs a digital processing operation on the digital baseband signal.(page 6, lines 8-11).

Independent claim 18 is directed to a method of using an RF receiver apparatus as in Figures 3-4 and 6. The RF receiver apparatus is formed on an integrated circuit (31). The RF receiver apparatus mixes (33) an analog RF signal down to an analog IF signal (37) within the RF receiver apparatus. An A/D converter (42) converts the analog IF signal into a digital IF signal (49) (step 61 of Figure 6). (page 6, lines 17-20). A digital IF-to-baseband converter (44) receives the digital IF signal and produces a signal (40) within the RF receiver apparatus. The digital baseband signal (40) is transmitted to a matched filter (45). (page 6, lines 20-21).

6. GROUNDS FOR REJECTION TO BE REVIEWED ON APPEAL

Claims 1-5, 7, 9, and 12-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Appellants' admitted prior art in view of Tröster et al., <u>An Interpolative Bandpass Converter on a 1.2-μm BiCMOS Analog/Digital Array</u>, VOL. 28, NO. 4, 471-477 (April 1993).

7. ARGUMENT

Independent claim 1 recites "An RF receiver apparatus, comprising: mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal; an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal; and an output coupled to said analog IF-to-digital baseband converter for transmitting said digital baseband signal."

Independent claim 9 recites "A baseband processor apparatus, comprising: an input for receiving a digital baseband signal from an RF receiver apparatus, said RF receiver apparatus comprising mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal and an analog IF-to-digital baseband converter formed on the first integrated circuit and coupled to receive said analog IF signal; and a digital communication processing portion coupled to said input for performing a digital processing operation on said digital baseband signal."

Independent claim 13 recites "A communication receiver, comprising: an RF receiver apparatus including mixing circuitry for mixing an analog RF signal down to an analog IF signal, an analog IF-to-digital baseband converter coupled to said mixer for converting said analog IF signal into a digital baseband signal, and an output coupled to said analog IF-to-digital baseband converter for outputting said digital baseband signal, said RF receiver apparatus formed on a first integrated circuit; and a baseband processor apparatus having an input coupled to said output of said RF receiver apparatus for receiving said digital baseband signal from said RF receiver apparatus, and a digital communication processor coupled to said input for performing a digital processing operation on said digital baseband signal."

Independent claim 18 recites "A method of using an RF receiver apparatus formed on an integrated circuit, comprising: mixing an analog RF signal down to an analog IF signal within the

RF receiver apparatus; converting the analog IF signal into a digital baseband signal within the RF receiver apparatus; and transmitting the digital baseband signal."

Regarding independent claims 1, 9, 13, and 18 and their respective dependent claims, the primary issues are 1) whether Appellants' admitted prior art and Tröster et al., An Interpolative Bandpass Converter on a 1.2-μm BiCMOS Analog/Digital Array, VOL. 28, NO. 4, 471-477 (April 1993) are properly combinable and 2) if combined, whether they teach or suggest all the limitations of claims 1, 9, 13, and 18.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. (MPEP § 2143). Appellants respectfully submit that examiner has failed to meet these criteria. Moreover, the examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the Examiner does not produce a *prima facie* case, the Appellants are under no obligation to submit evidence of nonobviousness. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). (MPEP § 2142). Examiner has failed to establish a *prima facie* case of obviousness for the following reasons.

1. SUGGESTION OR MOTIVATION TO COMBINE REFERENCES

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or

motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. (MPEP § 2143.01).

Tröster et al. disclose at Figure 6 (page 475) a circuit that is equivalent to baseband processor 13 of Figure 1 of Appellants' admitted prior art. At Figure 1 of the instant specification baseband processor 13 receives a digital IF signal 19 and produces a digital baseband signal 18. (page 2, lines 3-7). Likewise, Tröster et al. disclose in their Floorplan diagram of Figure 6 intermediate frequency input signal $X_{IF}(t)$ and baseband output signals I_{k1} and Q_{k1}. Furthermore, Tröster et al. state "Now the monolithic integration of the complete signal path from the IF signal range to the digital baseband processing is feasible." (Conclusion). Therefore, one of ordinary skill in the art would not think to combine Appellants' admitted prior art with the disclosure of Tröster et al. They are the same. Thus, Appellants respectfully submit that claims 1, 9, 13, and 18 and their respective depending claims are patentable under 35 U.S.C. § 103(a).

2. REASONABLE EXPECTATION OF SUCCESS

A *prima facie* obviousness case requires a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Here, a combination of Appellants' admitted prior art and Tröster et al. offers no chance of success. Tröster et al. disclose an IF-to-baseband conversion circuit at Figure 6, page 475. This IF-to-baseband conversion circuit is equivalent to the IF-to-baseband conversion circuit 13 at Figure 1 of Appellants' admitted prior art. A combination of Tröster et al. with Appellants' admitted prior art, therefore, would not produce "mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal" and "an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal" as required by claim 1. Independent claims 9, 13, and 18 include substantially these same limitations. Thus, Appellants respectfully submit that claims 1, 9, 13, and 18 and their respective depending claims are patentable under 35 U.S.C. § 103(a).

3. ALL CLAIM LIMITATIONS

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka,* 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson,* 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. § 103(a), then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). (MPEP § 2143.03). At least the following emphasized limitations are not disclosed by a combination of Appellants' admitted prior art with Tröster et al.

Regarding independent claim 1, neither Appellants' admitted prior art nor Tröster et al. disclose "An RF receiver apparatus, comprising: **mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal**; **an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal**; and an output coupled to said analog IF-to-digital baseband converter for transmitting said digital baseband signal."

Regarding independent claim 9, neither Appellants' admitted prior art nor Tröster et al. disclose "A baseband processor apparatus, comprising: an input for receiving a digital baseband signal from an RF receiver apparatus, said **RF receiver apparatus comprising mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal and an analog IF-to-digital baseband converter formed on the first integrated circuit and coupled to receive said analog IF signal**; and a digital communication processing portion coupled to said input for performing a digital processing operation on said digital baseband signal."

Regarding independent claim 13, neither Appellants' admitted prior art nor Tröster et al. disclose "A communication receiver, comprising: **an RF receiver apparatus including mixing circuitry for mixing an analog RF signal down to an analog IF signal, an analog IF-to-**

digital baseband converter coupled to said mixer for converting said analog IF signal into a digital baseband signal, and an output coupled to said analog IF-to-digital baseband converter for outputting said digital baseband signal, **said RF receiver apparatus formed on a first integrated circuit**; and a baseband processor apparatus having an input coupled to said output of said RF receiver apparatus for receiving said digital baseband signal from said RF receiver apparatus, and a digital communication processor coupled to said input for performing a digital processing operation on said digital baseband signal."

Regarding independent claim 18, neither Appellants' admitted prior art nor Tröster et al. disclose "A method of using **an RF receiver apparatus formed on an integrated circuit**, comprising: mixing **an analog RF signal down to an analog IF signal within the RF receiver apparatus; converting the analog IF signal into a digital baseband signal within the RF receiver apparatus**; and transmitting the digital baseband signal."

In an Advisory Action dated September 21, 2005, Examiner Pathak admitted Appellants' admitted prior art "does not disclose mixing circuitry and the analog IF-to-digital baseband converter circuitry (as disclosed in the AAPA described above) <u>to be implemented on the same integrated circuit</u>." Examiner Pathak further stated "This specific limitation is disclosed in the Troster reference." (page 3, paragraph 4). As previously stated, claim 1 specifically recites "An RF receiver apparatus, comprising: **mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal**; an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal." (emphasis added). Examiner Pathak **does not** contend that Tröster et al. disclose mixing circuitry "for mixing an analog RF signal down to an analog IF signal" on the same integrated circuit as the analog IF-to-digital baseband converter. He simply ignores this limitation in each independent claim.

In view of the above, Appellants respectfully request favorable consideration of the appeal from Final Rejection in the above referenced application, its reversal, and allowance of claims 1-19.

8. CLAIMS APPENDIX

1. An RF receiver apparatus, comprising:

mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal;

an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal; and

an output coupled to said analog IF-to-digital baseband converter for transmitting said digital baseband signal.

2. The apparatus of Claim 1, comprising a baseband processing apparatus formed on a second integrated circuit and coupled to said output.

3. The apparatus of Claim 1, wherein said analog IF-to-digital baseband converter includes an A/D converter for digitizing said analog IF signal to produce a digital IF signal, and a digital IF-to-baseband converter coupled to said A/D converter for converting said digital IF signal into a further digital baseband signal.

4. The apparatus of Claim 3, where said analog IF-to-digital baseband converter includes a filter coupled to said digital IF-to-baseband converter for filtering said further digital baseband signal to produce said first-mentioned digital baseband signal.

5. The apparatus of Claim 4, wherein said filter includes a decimator.

6. The apparatus of Claim 4, wherein said filter includes a quantizer.

7. The apparatus of Claim 3, wherein said digital IF-to-baseband converter includes a CORDIC circuit.

8. The apparatus of Claim 1, wherein said analog IF-to-digital baseband converter produces said digital baseband signal in parallel format, and including a parallel-to-serial converter connected between said analog IF-to-digital baseband converter and said output, said parallel-to-serial converter providing a serial formatted digital baseband signal to said output.

9. A baseband processor apparatus, comprising:

an input for receiving a digital baseband signal from an RF receiver apparatus, said RF receiver apparatus comprising mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal and an analog IF-to-digital baseband converter formed on the first integrated circuit and coupled to receive said analog IF signal; and

a digital communication processing portion coupled to said input for performing a digital processing operation on said digital baseband signal.

10. The apparatus of Claim 9, wherein said input is for receiving said digital baseband signal in serial format, and including a serial-to-parallel converter connected between said input and said digital communication processing portion for converting said digital baseband signal from serial format to parallel format and providing said parallel formatted digital baseband signal to said digital communication processing portion.

11. The apparatus of Claim 10, wherein said serial-to-parallel converter includes an input for receiving a clock signal from the RF receiver apparatus.

12. The apparatus of Claim 9, formed on a second integrated circuit.

13. A communication receiver, comprising:

an RF receiver apparatus including mixing circuitry for mixing an analog RF signal down to an analog IF signal, an analog IF-to-digital baseband converter coupled to said mixer for converting said analog IF signal into a digital baseband signal, and an output coupled to said analog IF-to-digital baseband converter for outputting said digital baseband signal, said RF receiver apparatus formed on a first integrated circuit; and

a baseband processor apparatus having an input coupled to said output of said RF receiver apparatus for receiving said digital baseband signal from said RF receiver apparatus, and a digital communication processor coupled to said input for performing a digital processing operation on said digital baseband signal.

14. The communication receiver of Claim 13, wherein said baseband processor apparatus is formed on a second integrated circuit.

15. The communication receiver of Claim 14, wherein said analog IF-to-digital baseband converter comprises a coordinate rotation digital computer.

16. The communication receiver of Claim 14, wherein said baseband processor apparatus is a digital signal processor.

17. The communication receiver of Claim 13, wherein said RF receiver apparatus is provided as an integrated circuit.

18. A method of using an RF receiver apparatus formed on an integrated circuit, comprising:

mixing an analog RF signal down to an analog IF signal within the RF receiver apparatus;

converting the analog IF signal into a digital baseband signal within the RF receiver apparatus; and

transmitting the digital baseband signal.

19. The method of Claim 18, wherein said transmitting step includes transmitting the digital baseband signal in serial format.

9. EVIDENCE APPENDIX

1) *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

2) *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

3) *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

4) *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

5) *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

9. RELATED PROCEEDINGS APPENDIX

None.

Respectfully submitted,

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